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whence

$$x' = +2''\cdot340 \pm 0''\cdot235,$$
$$y' = -0\cdot1206 \pm 0\cdot013,$$

and

$$\text{True diameter} = 11''\cdot10(1+y') = 9''\cdot761 \pm 0''\cdot147. \qquad (2)$$

Combining (1) and (2), we obtain for the final value of diameter of *Mars* as measured with the Greenwich Transit-Circle—

$$9''\cdot697 \pm 0''\cdot107.$$

If the adopted diameter be $9''\cdot697$, $x$ and $x'$ will require slight modifications; let $a$ and $b$ be the corrected values, then

$$a + 9''\cdot697 = 2''\cdot399 + 9''\cdot625, \quad \therefore a = 2''\cdot327$$
$$b + 9\cdot697 = 2\cdot340 + 9\cdot761, \quad \therefore b = 2\cdot404.$$

Combining $a$ and $b$, we find

$$\text{Constant Correction} = 2''\cdot369 \pm 0''\cdot175.$$

This correction is unusually large; for instance, with the Washington Mural-Circle, the aperture of the object glass of the telescope of which is four inches, the corresponding quantity is found to be $1''\cdot192$.

It might be expected from *a priori* considerations that the larger aperture would give a smaller irradiation-constant; there is, however, evidence to show that the value of the correction in question does not appear to follow any law depending on the aperture of the telescope employed.

1880, *November* 11.

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## *The Motions and Varieties of the Jovian Spots.*

### By W. F. Denning, Esq.

Those who have telescopically observed *Jupiter* during the last few months can hardly fail to have been struck with the very remarkable changes exhibited in the positions and forms of his spots. This remark does not apply, however, to the great red spot which has maintained a constancy of appearance and regularity of motion, in singular contradiction to the white oval patches, alternating with dark spaces along the equator, and to a series of dark spots which have been visible on a belt lying N. of the equatorial zone.

As to the large spot, I always see it with a minute black speck at its interior f. end. This is distinctly visible when either on the

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east or west limb; more plainly when in the latter position; so that I infer the great spot is not a cavity, or the black point alluded to, if situated on its sloping side, must disappear as it approached the west limb. The ends of the Great spot taper, as in following sketch (see lithograph). It lies perfectly parallel with the equatorial belt, which shows no perceptible depression, as some observers have intimated, in that portion immediately adjacent to the spot.

On Oct. 18, while watching the transits of Sat. I. and II., I noticed an unusually bright patch projecting out of the great S. belt towards the equator. It was followed by a white oval marking, and as it neared the W. limb I made a sketch as follows (see lithograph).

This object was the brightest and most conspicuous of its class on the planet, and from the date that it was first seen, on Sept. 18 at 11$^{h}$ 50$^{m}$, until Nov. 23, it was carefully reobserved on every possible occasion, and its times of transit across the central meridian cautiously estimated. Relatively to the red spot, it soon manifested a great change of position. It was seen at places considerably in advance of that predicted on the assumption of a rotation period of 9$^{h}$ 55$^{m}$ 34$^{s}$. It passed the central meridian at about 10$^{h}$ 30$^{m}$ on Oct. 18, and on Oct. 20 at 11$^{h}$ 38$^{m}$. The period was approximately 5½ minutes less than the red spot. After Oct. 20th it was closely watched, and by Nov. 21 had been reobserved on thirteen nights. On the latter date it crossed the meridian at 10$^{h}$ 41$^{m}$, and the resulting observed period from a mean of all the observations was 9$^{h}$ 50$^{m}$ 5$^{s}$, which, though depending upon eye-estimations of the transits, cannot be far wrong. If this rapid motion of the spot, from west to east around *Jupiter*, continues, it will complete its circuits of the planet in about 45 days=108 rotations of the great spot.

Mr. H. Corder at Writtle, near Chelmsford, had, with only a 4½-in. reflector, noticed a similarly rapid movement of the white equatorial spots from his observations in the autumn of 1879 (see *Observatory*, December 1879, pp. 238–9). He inferred an "independent rotation, relatively to the red spot, in about 40 days."

On Oct. 23, at 11$^{h}$, I saw several minute, dark objects, looking like a train of Sun-spots, upon a dusky belt to the N. of the great equatorial shading. I saw them again on Oct. 29, 30, 31, Nov. 2, 3, 4, and 8, and they showed remarkable changes. The group was evidently lengthening in the direction of the belt, and the constituent spots varied from day to day. On Oct. 29 the whole group passed the central meridian in less than an hour, whereas on Nov. 8 it occupied double that interval. The spots had further developed to such an extent by Nov. 23 as to range over 120 degrees of longitude, for they were 3$^{h}$ 19$^{m}$ in crossing the meridian of *Jupiter* on that date. I figured the spots each night (see lithograph).

The same swift movement eastwards upon the planet (from east to west observed from the Earth) as that noticed in regard

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